

**Supplemental Environmental Analysis
For Purposes of
2003-2004 Dredging
(Lower Snake and Clearwater Rivers, Washington and Idaho)**

Attachment H

**Overview of the 2002 DMMP/EIS
Cost-Benefit Analysis**

**U.S. Corps of Engineers
Northwestern Division**

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The Corps guidance for economic evaluation of DMMPs is presented in two regulations, ER 1105-2-100, Planning Guidance Notebook and Policy Guidance No. 40, Development and Financing of Dredged Material Management Studies. ER 1105-2-100 implements the Water Resource Council's, "Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies," signed by President Reagan on March 10 1983, commonly referred to as the Principles and Guidelines (P&G). The P&G establish the guidelines for which all water resource analysis is conducted by the Corps, Bureau of Reclamation, Natural Resource Conservation Service, and the Tennessee Valley Authority. Guidance for conducting remaining benefit-remaining costs ratio is provided annually in Program Development Guidance for each year's budget process. The budget Engineering Circular (EC) is EC 11-2-183, 31 March 2002.

The guidance from these are summarized below:

- ER 1105-2-100, Section E-15, b. (4),

b. Management Plan Development Principles.
(4) Demonstrate continued maintenance is economically warranted based on high priority (non-recreation) benefits. If it cannot be demonstrated based on high priority benefits but would otherwise be warranted considering recreation benefits, recommendations will state that project is economically warranted using recreation benefits.
- Policy Guidance No. 40, Section 2. c. (1)

c. Management Plan Study Components. (1). Continuing Economic Justification. The first step in dredged material management planning is a confirmation of the economic justification for continuing maintenance of the project or increments of the project based on a review of appropriate indicators. If this review indicates that economic justification for continued maintenance is questionable, a more detailed analysis must be made. Continued economic justification must also be demonstrated when management plan studies identify the need for any major new investments or other significant increase in maintenance cost (for example the provision of a new confined disposal facility or use of a more distant ocean disposal site). Where projects or increments of projects are not justified for continued maintenance, the management plan shall provide for appropriate adjustments in the maintenance program which could include deferral of dredging, maintenance to lesser project dimensions or the orderly curtailment of maintenance.
- Program Development Guidance, EC 11-2-183, Section B-2.12.
Remaining Benefit-Remaining Cost Ratio (RBRCR), paragraph a:
a. Consider anticipated Federal and non-Federal allocations and other non-Federal costs through the PY-1 as sunk, and exclude them from the RBRCR computation. (Note: in this case PY-1 refers to costs incurred before FY 03.)

The economic analysis in the DMMP/EIS was conducted under these principles and demonstrated that the continued maintenance of the Snake River navigation system was economically justified with a BCR of 16.0. This BCR analysis utilized economic benefit information that was developed as part of the Lower Snake River Juvenile Salmon Migration Feasibility Report/EIS, February, 2002 (LSRJSMFR/EIS). The economic analysis in the LSRJSMFR/EIS was extensive, well coordinated, and extensively reviewed. Given this large BCR and the recent economic study, more detailed analysis was not necessary. The BCR analysis is the standard approach of comparing the expected benefits of a proposed water resource project to the expected costs associated with that alternative (consistent with P&G). The benefits and costs of an alternative are computed by comparing the economic benefits and costs that will occur over time with the proposed alternative to the benefits and costs that will incur without the proposed project. The “without project condition” is the situation most likely to occur without any proposed federal action. In the DMMP economic analysis this “without project condition” was assumed to be no further maintenance of the Snake River navigation channel and the associated maintenance of the locks and other navigation-related costs at the four Lower Snake River dams. In this without project condition, it was assumed that navigation would eventually cease in the Snake River and movement of commodities would occur with other modes of transportation in a more costly manner. The “with project condition” was assumed to be the continued maintenance of the navigation system with the different alternatives evaluated in the DMMP/EIS. The analysis was done following standard economic procedures and Corps policy guidance, as established in P&G, that “confirmed the economic justification for continuing maintenance.”

The important element of the economic analysis for the purpose of the DMMP is to identify the remaining benefits and remaining costs associated with the authorized navigation purpose. The remaining benefits are the stream of benefits associated with transportation savings with moving commodities by barge. The remaining costs are the operation and maintenance (O&M) costs associated with the navigation system. If O&M of the channel and lock facilities is not conducted, all the expected economic benefits associated with barging will be eventually be lost. As such, the benefit stream presented in the DMMP is assigned to the required new investment needed to maintain the continued operation of the project.

Sunk costs are costs that are already incurred and cannot be recovered regardless of which of alternative is chosen. It is incorrect to include costs already incurred (mostly in the 1960s and 1970s) to build the dams in his modified BCR. Clearly, these sunk costs will not be recovered whether the dredging plan proposed in the DMMP is implemented or not. Hence the costs are irrelevant to the analysis. Inclusion of large cost items that are sunk cost is not consistent with Corps guidance and standard economic principles. Inclusion of sunk cost in the BCR violates the most basic element of economic and decision analysis. Definition for sunk cost can be found in any basic resource economic text. As an example, L. Douglas James and Robert R. Lee, McGraw Hill 1971 . The following concept is so basic to engineering economic analysis it is included in the first chapter of this widely used text.

SUNK COST. The justification for following a course of action depends on the events occurring with it being better than those occurring without it, by an amount exceeding its implementation cost. An engineering economy study need analyze only differences between alternatives and differences between resulting consequences. All costs and benefits unaffected by which alternative is chosen should be disregarded. Obviously, past events have already occurred and cannot be retracted by future action. Past expenditures, or sunk costs, are past events and thus should have no influence on deciding among alternatives except as they affect future cash flows.

Chapter One, Principles of Engineering Economics, section 1-4, page 6 - 7.

The \$1.3 billion spent to build the four Lower Snake River Dams, including the navigation related costs, have already occurred and clearly do not change with the decision to continue to maintain the Lower Snake navigation system (the “with project condition”), or to not maintain the navigation channel and system (the “without project condition”). These are sunk costs and should not be considered in making the decision to dredge or not dredge.

Effects of Freight Growth Forecasts

The Corps used data that was the most current at the start of the study. Subsequent freight forecast became available following completion of the analysis. Updated draft commodity shipment forecasts for the Columbia River Improvement Project (channel deepening to 43 feet - March and July 2002) were reviewed to determine if they would alter the findings presented in the Final DMMP/EIS. These new forecasts provide lower projections of commodity shipments, but did not provide data contradicting the findings of the Final DMMP/EIS. The continued maintenance of all navigation channel segments is justified, even considering the reduced tonnage scenario presented in the updated Columbia River export forecast. In addition, the Corps considered recent trends in commodity shipments (i.e., 1995 - 2000) and used the actual 2000 lower Snake River grain shipment data in a re-evaluation of its economic analysis. To answer question raised concerning the validity of the forecast and the resultant BCR a new analysis was done with the most current data. The forecasts published in the Columbia River Channel Improvement Project (CRCIP) Draft Supplemental Integrated Feasibility Report and Environmental Impact Statement, July 2002, show declines relative to the volumes forecasted in the final CRCIP 1999 report. The CRCIP forecasts were not developed for the Snake River project and are not specific to the Snake River. We have, however, compared the projection used in the DMMP EIS with the projections published in the CRCIP 1999 and 2002 reports for grain shipments in the Columbia River. The CRCIP 2002 projection is 75.8% of the CRCIP 1999 projection. While it is not necessarily appropriate to apply that same reduction to the DMMP analysis, to illustrate the robust nature of the benefits of Lower Snake River navigation, the following calculations apply those assumptions to the analysis. Since grain represents the dominant commodity on the Lower Snake River, we multiplied the earlier benefit of \$43.2 million by 0.758 to get a hypothetical estimate of \$32.7 million.

When comparing the hypothetical navigation benefit to the \$2.7 million annual cost, the hypothetical benefit/cost ratio is still 12.1. Therefore, it is concluded that any application of CRCIP 2002 data would not alter the findings of the DMMP/EIS.

**Columbia River Wheat Projections
(short tons)**

Year	Original Projection	Hypothetical Projection	% of Original
2004	14,518,651	11,528,504	79.40%
2007	14,624,166	11,528,504	78.83%
2014	14,729,680	12,261,703	83.24%
2017	15,350,975	12,994,901	84.65%
2024	15,972,270	13,105,139	82.05%
2027	17,518,705	13,215,377	75.44%
2034	19,065,140	13,222,904	69.36%
2037	19,246,540	13,230,430	68.74%
2044	19,427,940	13,230,430	68.10%
2047	19,427,940	13,230,430	68.10%

Average percentage of original projections = 75.8%

The updated Columbia River projections are still in draft form and were released in July 2002. Economic analysis utilized the most current available data at the time of the analysis. The incremental analysis considered all relevant costs based on recent data and trends, and provides a realistic comparison of benefits and costs associated with dredging. The incremental analysis considered grain shipments only, which represents approximately 78.8 percent of commodity shipments on the lower Snake River. Other commodities shipped include petroleum, fertilizer, wood chips and lumber, aggregate, and other products. Therefore actual benefits considering the total percentage of commodity shipments would be greater than those demonstrated in the incremental analysis.

Hydropower Cost

Federal law established that the allocated hydropower costs would be repaid to the Treasury over 50 years through the sale of the surplus electricity generated at the Corps projects by the Bonneville Power Administration. However, the costs allocated to navigation are considered Federal costs and are not reimbursed to the Treasury by the navigation interests. That is, put in layman terms, there is no "mortgage payment" for the construction costs allocated to navigation or other non-power uses, such as flood control or fish and wildlife.

Other Costs of the Dams

The project for this study is maintenance dredging; it is not construction or operation of the dams, which has and continues to effect fish runs. To consider these costs in an economic analysis (i.e. economic costs associated with navigation's share of the impact to the fish runs caused by dams), the proposed project would necessarily include some action to change the dams, e.g. dam removal. However, as the with project condition in this instance is dredging the navigation channel, the associated environmental impacts including dredging, disposal, and levee raise under the with and without project conditions are essentially the same for the economic analysis of any environmental impacts. Therefore, just like the sunk costs discussed previously, the proposed dredging project will not change the environmental impacts associated with the dams, nor any associated economic benefits foregone. These effects are not relevant to the decision to continue dredging, or discontinue dredging the Snake River navigation channel.

The environmental impacts associated with maintenance dredging, the with project condition, include the impacts associated with dredging, disposal, and levee raise. These impacts were assessed and included categories for aquatic resources, terrestrial environment, endangered species, recreation, cultural resources, socioeconomic, transportation, geology and soils, water quality, toxins, air quality, noise, aesthetics, and cumulative effects. All categories had both positive and as negative effects, but the differences were insignificant and not included in the BCR calculation. It is unlikely that stopping maintenance dredging will increase the salmon and steelhead runs. Any impacts that may be attributed to the dams would occur without continuing dredging operations. The status of the salmon and steelhead runs is associated with many factors, and ceasing to conduct maintenance dredging will not restore the runs to high levels.

Dam removal should not be confused with the cessation of dredging. Stopping dredging will not remove the Snake River dams, so the impacts to fish associated with the dams would be essentially the same with or without dredging.

Sudden Halt To Navigation

The incremental analysis of navigation does not assume all freight will leave within one year, but rather it assumes shoaling (over time) throughout the lower Snake. The following section is a response to comments that discuss navigation.

b. DMMP/EIS ROD - September 2002 Responses NWF Comments, Page 21

The purpose of this DMMP/EIS is, in part "to develop and evaluate alternative programs to maintain the authorized navigation channel and certain publicly-owned facilities in the lower Snake River and McNary reservoirs for the next 20 years." The Draft DMMP/EIS performed a benefit analysis on the authorized Federal navigation project to ensure that the project remained economically

feasible. For this analysis two shallower Federal navigation channels, with controlling depths of 13 feet and 12 feet, were assumed to result from termination of maintenance dredging. Grain shipments, representing 78.8% of the commerce on the Snake River for the period of 1987 to 1996, were selected to represent the impacted commerce. Grain barge costs for shipments from the various ports on the Snake River system were developed to reflect light loading to accommodate the shallower channels. Reduced cargo capacity of the standard 3,600-ton grain barge (274 feet long, 42 feet wide, and 13.5 feet draft) with drafts of 12.5 feet and 11.5 feet were determined to be 3,270 tons and 2,950 tons, respectively. The impact of this reduced capacity would be to raise per ton barge costs by 10% and 22%, respectively. The resultant increase in transportation costs for moving the forecast grain shipments from the Snake River in the 20-year period from 2004 to 2024 was compared to the avoided annual cost of maintenance dredging. The result of this analysis, based on 1999 costs, indicated that dredging costs were equal to the estimated increase in barge costs when the channel capacity was reduced by only one foot. However, where channel depths were reduced by two feet, the cost of dredging was about half of the increased cost to barge transportation. In essence, shoaling that reduces the channel depth by one foot represents the "break even" point where maintenance dredging is feasible and cost-effective. River system and, thus, impacts related to multiple shoaling scenarios. There are an infinite number of combinations of shoaling scenarios. Due to uncertainties associated with sedimentation and in compliance with guidance, the DMMP incremental analysis used average annual costs (expected average annual dredging costs over the 20 year period) and benefits (the annual transportation cost savings by foregoing light-loading) to demonstrate that each reach increment was economically justified. In accordance with current policy and regulations, the analysis considered average annual cost to average annual benefits based on historical dredging requirements for the lower Snake River, to provide an appropriate estimation of average annual conditions over period of analysis for the DMMP. An incremental analysis was performed and demonstrates that dredging each increment was justified. In the past, barge operators have been forced to light-load on occasion due to shoaling. The incremental analysis assumes light loading (e.g., assume 13 foot and 12 foot channel depths) would be required, and compares the cost of light loading to the cost of dredging. The incremental analysis demonstrates that if all dredging cost were incurred to prevent even a one-foot shoal, dredging is economically justified for each increment of the system. See other responses regarding total system benefit analysis.

Conclusion

The economic analysis was completed following Corps guidance and standard economic practices, using the most current available data. Following publication of the ROD, more current data became available and other assumptions were examined to determine their effect on the BCR for dredging. New data and other assumptions that are not accepted by Corps guidance or general economic practice were used as a

sensitivity analysis to re-calculate BCR. The BCR dropped from 16:1 to 8.75:1. The lower BCR does not use proper methods, but was calculated as a test of assumptions that would be the least supportive of dredging.

It is clear from this analysis that continued dredging is beneficial and a wise use of Federal expenditures.